

Field of invention

5

10

15

20

30

It is further possible to assign different encryption keys of the same algorithm to different data columns. With multiple keys in place, intruders are prevented from gaining full access to any database since a different key could protect each column of encrypted data.

In the above mentioned solutions the system administrator is responsible for setting the user permissions. Thus, for a commercial database, the system administrator operates through a middle-ware, the access control system (ACS), which serve for authentication, encryption and decryption. The ACS is tightly coupled to the database management system (DBMS) of the database. The ACS controls access in real-time to the protected elements of the database.

Such a security solution provides separation of the duties of a security administrator from a database administrator (DBA). The DBA's role could for example be to perform usual DBA tasks, such as extending tablespaces etc, without being able to see (decrypt) sensitive data. The SA could then administer privileges and permissions, for instance add or delete users.

For most commercial databases, the database administrator has privileges to access the database and perform most functions, such as changing password of the database users, independent of the settings by the system administrator. An administrator with root privileges could also have full access to the database. This is an opening for an attack where the DBA can steal all the protected data without any knowledge of the protection system above. The attack is in this case based on that the DBA impersonates another user by manipulating that users password, even though the user's password is enciphered by a hash algorithm. An attack could proceed as follows. First the DBA logs in as himself, then the DBA reads the hash value of the users password and stores this separately. Preferably the DBA also copies all other relevant user data. By these actions the DBA has created

006277" 50052260

5

10

### Object of the invention

20

The object is achieved by a method and a system according to the appended claims.

## Summary of the invention

30

35

replacing said stored password hash value with said new password hash value.

Preferably, the method comprises the further steps  
of:

25       With the method above the intrusion is detected when  
a user tries to log in, since the hash value of the users  
password will not match. In order to detect intrusion  
earlier the method can preferably comprise the further  
step of comparing for each active user having access to  
30 sensitive data, the hash value of the current login  
password with the currently stored password hash value,  
whereby said step is performed after every change of the  
database content by said user.

In one embodiment, the trigger comprises means for  
35 reading a log of actions on said database, means for  
identifying commands for altering of user passwords in  
said log and means for identifying which user passwords

that have been changed. Preferably the trigger is a daemon process.

Also according to the invention a impersonation prevention system for a relational database preventing an administrator impersonating another user, which database at least comprises a table with at least a user password, wherein said password is stored as a hash value, said system comprises:

calculation means for calculating a hash value of a user password;

trigger means, which trigger at least said calculation means for calculation of a new hash value of said password when an administrator alters said table through the database management system (DBMS) of said database; and

replacing means for replacing said stored hash value with said new hash value for each triggered calculation.

Such a system will overcome the risk for a DBA impersonating a user with all the advantages as the method previously described.

#### Brief description of the drawing

For exemplifying purposes, the invention will be described to embodiments thereof illustrated in the attached drawing, wherein:

Fig. 1 is a schematic view of a system according to the invention; and

Fig. 2 is a flow-chart illustrating a method according to the invention.

#### Description of preferred embodiments

Referring to fig. 1, a schematic view of the components in a granular protection system of a database are shown. The central repository of the data is the database. In this case it is a relational database. An example of such a database is Oracle8®, manufactured and sold by Oracle Corporation, USA. The data is stored in

005217" 500521760

5  
10

15  
20  
25

30

35

Thus, an user accesses the database through an application, which in turn uses the DBMS to access the database. During the access, the ACS interacts in real time with the DBMS to permit or deny the access attempt. But, a DBA will always have access to the database. However, in order to protect the information for the DBA, sensitive data is encrypted by the ACS. But, there is risk that the DBA would impersonate an user in order to gain access to decrypted data. This is as described prevented by a system and a method according to the invention. Such a system according to a preferred embodiment will now be described.

The system further comprises trigger means for triggering the calculation means for calculation of a new hash value. The trigger means survey the actions of a administrator and triggers an action when the administrator attempts to change the password of a user through the DBMS. Then the calculation means are triggered and a new hash value is calculated.

2025 RELEASE UNDER E.O. 14176

implemented in the DBMS data language. The trigger could register each occasion an alter is made on the table, and preferably separate those alters that concern user passwords. Another possibility is to read the log or  
 5 cache of the DBMS and search for altering statements. The trigger function could be implemented as a daemon process.

In another step, S2, depending on if a trigger has been fired, a new hash value of the same password is  
 10 calculated. The new hash value differs from the previously stored hash value. This hash algorithm is not accessible by the DBA and is preferably executed within the ACS.

Then the new calculated hash value replaces the  
 15 stored hash value in a step S3.

In another embodiment of the method according to the invention the integrity of the trigger is also checked at regular intervals. Otherwise, the DBA could deactivate the trigger temporarily in order to impersonate a user  
 20 without being discovered. Therefore a snapshot is preferably created of the trigger. This could be done by creating a checksum or a hash value of the trigger which could be stored separately or in conjunction with the trigger.

The DBA attack will be discovered either when a user  
 25 logs in or during the attempt. If the hash value of a user password is compared with the stored hash value and the comparison results in a mismatch, the user will not be able to log in. But, preferably after every action by  
 30 a user, which has access to sensitive data, the hash value of the users login password should be compared with the stored password. In that way the DBA attack will be discovered sooner.

The invention has been described above in terms of a  
 35 preferred embodiment. However, the scope of this invention should not be limited by this embodiment, and alternative embodiments of the invention are feasible, as

00622T" 50052260



5        Such embodiments should be considered to be within  
the scope of the invention, as it is defined by the  
appended claims.